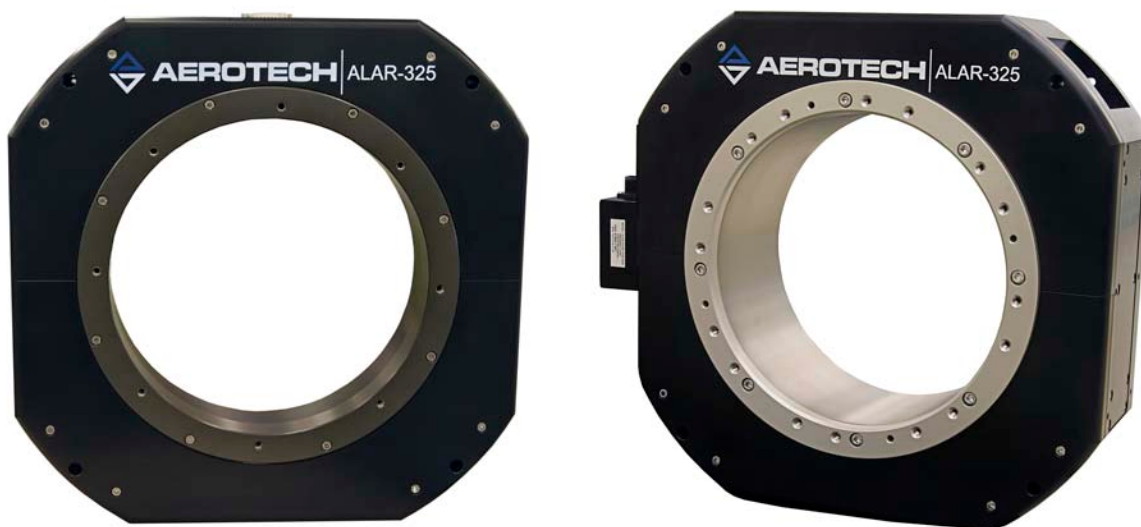


ALAR Series Stage

User's Manual

P/N: EDS121 (Revision 1.06.00)



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Chapter 1: Overview

This chapter introduces standard and optional features of the ALAR stages and gives general safety precautions. The ALAR series is available in both continuous and limited travel versions. The apertures in the series range from 100 mm to 325 mm in diameter.



Figure 1-1: Standard ALAR Rotary Stages

NOTE: Aerotech continually improves its product offerings, and listed options may be superseded at any time. Refer to the the Aerotech Motion Control Product Guide for the most current product information at www.aerotech.com.

1.1. Standard Features

All ALAR stages incorporate direct drive brushless motors. The maintenance free direct drive and slotless motor design combine to create outstanding angular positioning and velocity control with exceptionally large apertures. This is especially useful in scanning applications where torque ripple cannot be tolerated. Other added benefits of the direct drive are zero backlash and higher speeds.

Every ALAR stage is designed around a set of angular contacts used to maximize performance with respect to wobble, moment stiffness, and rotating friction. A precision-machined shaft further minimizes wobble. The design incorporates integral connections that minimize cable issues.

ALAR stage performance is assured with resolutions from 0.02 arc-sec/count to 0.009 arc-sec/count. The motor and high-performance rotary encoder are directly coupled to a common shaft.

The ALAR comes in two different configurations. The standard profile (SP) unit has high payload capacity and high moment load stiffness so it can handle applications where its rotation axis is parallel or perpendicular to gravity and the payload center of gravity is cantilevered away from the stage. The low profile (LP) unit has high payload capacity and is good for applications where the axis of rotation is parallel to gravity. Both the SP and LP units have the same aperture options and motor options. All ALAR stages can handle between 300-1300 lb of axial load.

1.2. Optional Features

1.2.1. Limited Travel Option

The ALAR series of rotary stages are available in limited travel models for light duty applications. These models are offered in total travels of 10° through 340°. Consult factory for standard travel ranges. Limit travels can also be customized to meet the needs of individual applications. In heavy-duty applications such as large payloads and/or high torque requirements, custom hardstops are available. Contact the Aerotech factory for your particular requirements.

1.2.2. Brake Option

The ALAR series of rotary stages is available with brakes through custom engineering special order. These brakes are customer application dependant. Please consult factory for details.

1.2.3. High Torque Option

Two of the large sizes of the ALAR series of rotary stages are available with 50% higher torque for higher performance applications (refer to Table 3-2).

1.3. Model Numbers and Ordering Options

The stage model number indicates the optional features on a particular stage. To determine the options on your stage, refer to Table 1-1 for an explanation of the numbering system.

Table 1-1: Model Numbering System

Stage	Aperture Diameter	Height	Options
ALAR-100-LP	100 mm	65 mm	
ALAR-100-LP-LIx	100 mm	75 mm	Limited Travel
ALAR-150-LP	150 mm	65 mm	
ALAR-150-LP-LIx	150 mm	75 mm	Limited travel
ALAR-200-LP	200 mm	100 mm	
ALAR-200-LP-LIx	200 mm	110 mm	Limited travel
ALAR-250-LP	250 mm	100 mm	
ALAR-250-LP-LIx	250 mm	115 mm	Limited travel
ALAR-325-LP	325 mm	100 mm	
ALAR-325-LP-LIx	325 mm	115 mm	Limited travel
ALAR-100-SP	100 mm	100 mm	
ALAR-100-SP-LIx	100 mm	110 mm	Limited travel
ALAR-150-SP	150 mm	100 mm	
ALAR-150-SP-LIx	150 mm	110 mm	Limited travel
ALAR-200-SP	200 mm	150 mm	
ALAR-200-SP-LIx	200 mm	160 mm	Limited travel
ALAR-250-SP-2	250 mm	150 mm	
ALAR-250-SP-2-LIx	250 mm	165 mm	Limited travel
ALAR-250-SP-3	250 mm	150 mm	Higher Torque
ALAR-250-SP-3-LIx	250 mm	165 mm	Higher Torque, Limited travel
ALAR-325-SP-2	325 mm	150 mm	
ALAR-325-SP-2-LIx	325 mm	165 mm	Limited travel
ALAR-325-SP-3	325 mm	150 mm	Higher Torque
ALAR-325-SP-3-LIx	325 mm	165 mm	Higher Torque, Limited travel

1.4. Dimensions

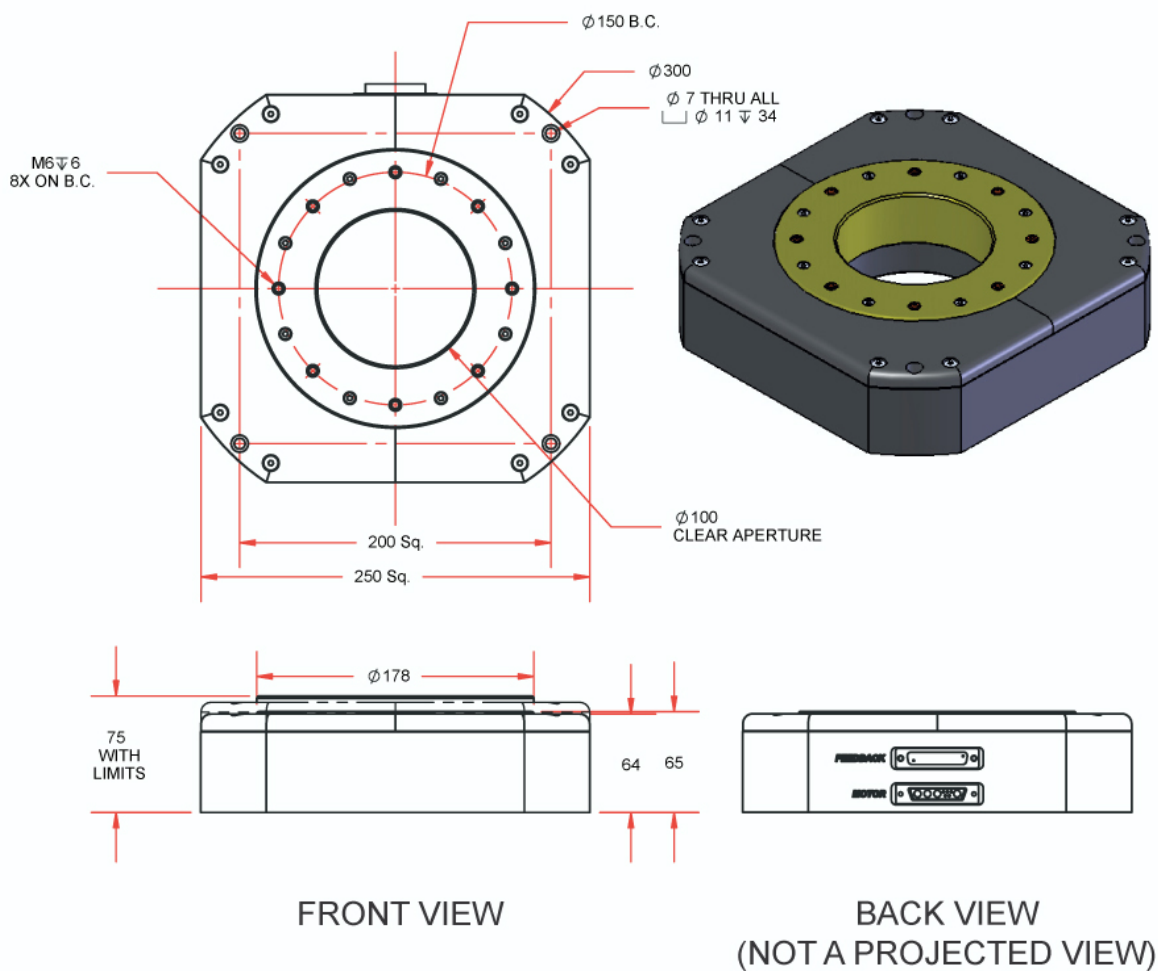


Figure 1-2: ALAR-100-LP Dimensions

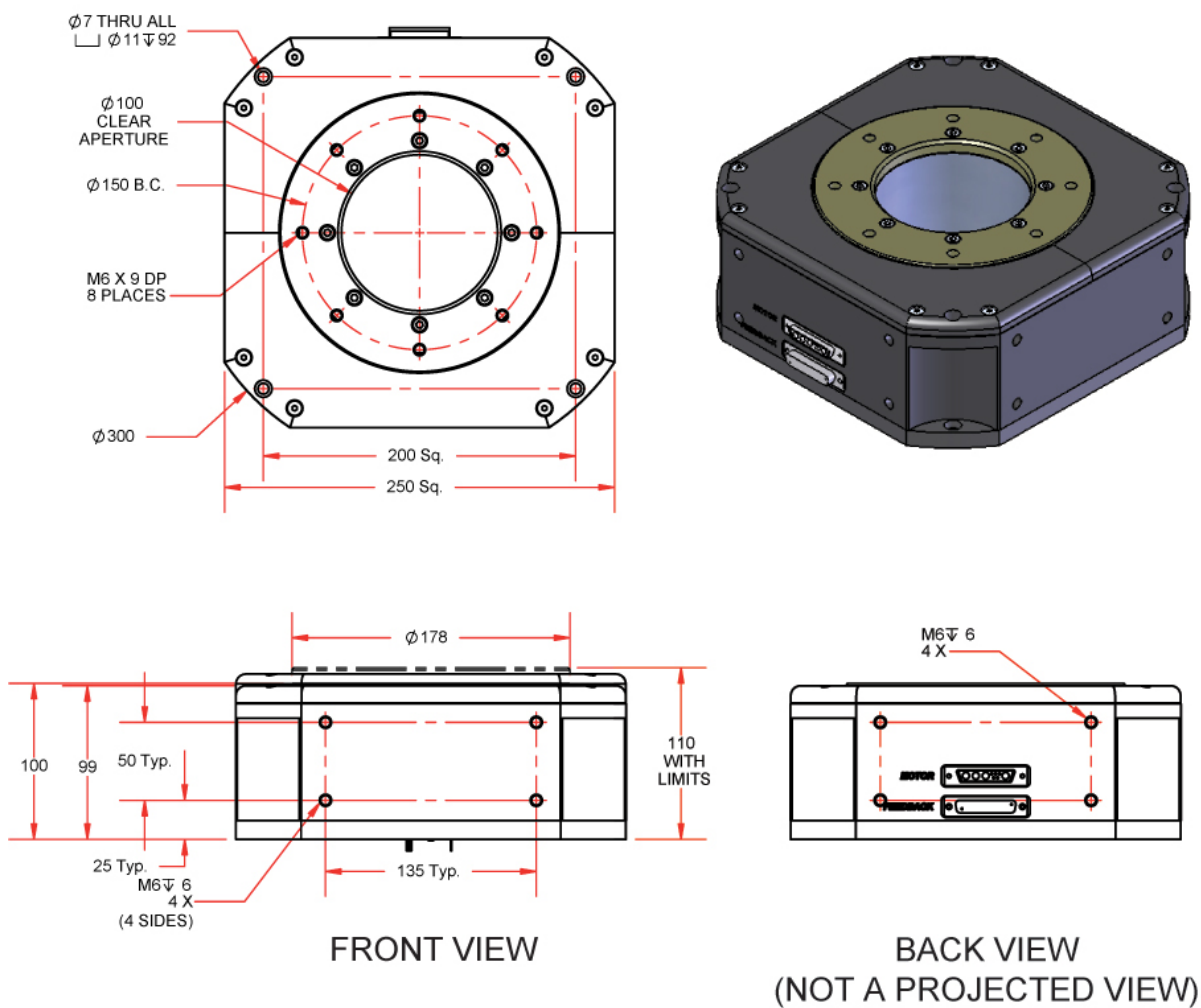


Figure 1-3: ALAR-100-SP Dimensions

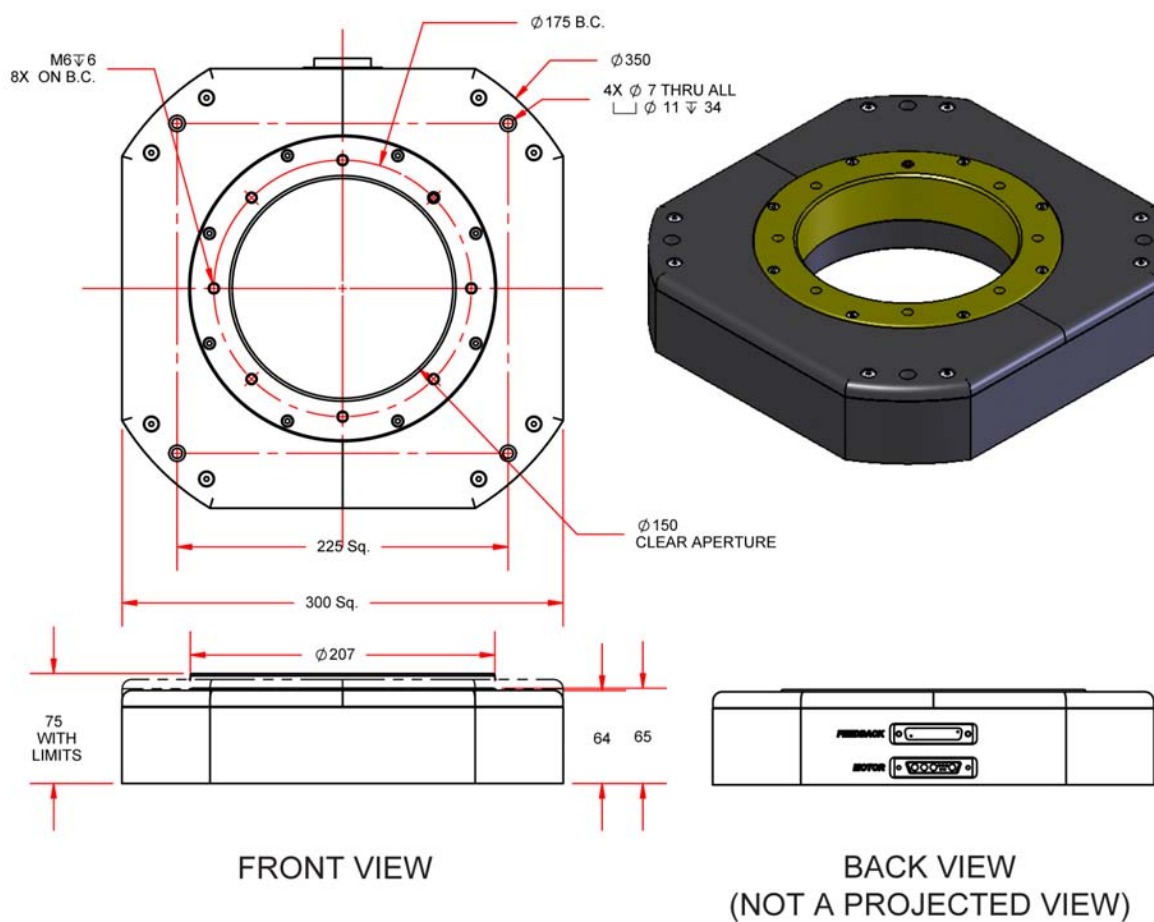


Figure 1-4: ALAR-150-LP Dimensions

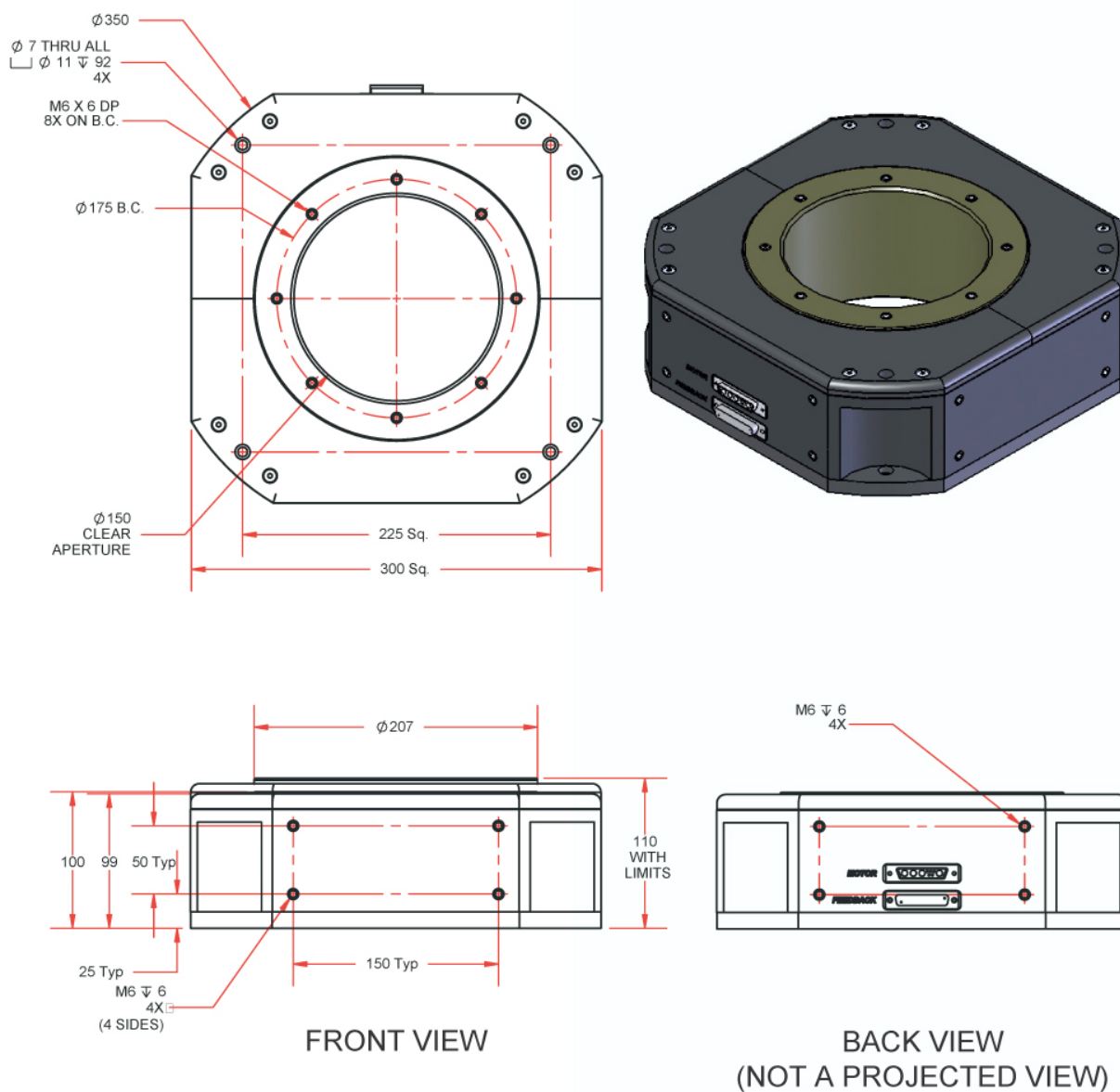


Figure 1-5: ALAR-150-SP Dimensions

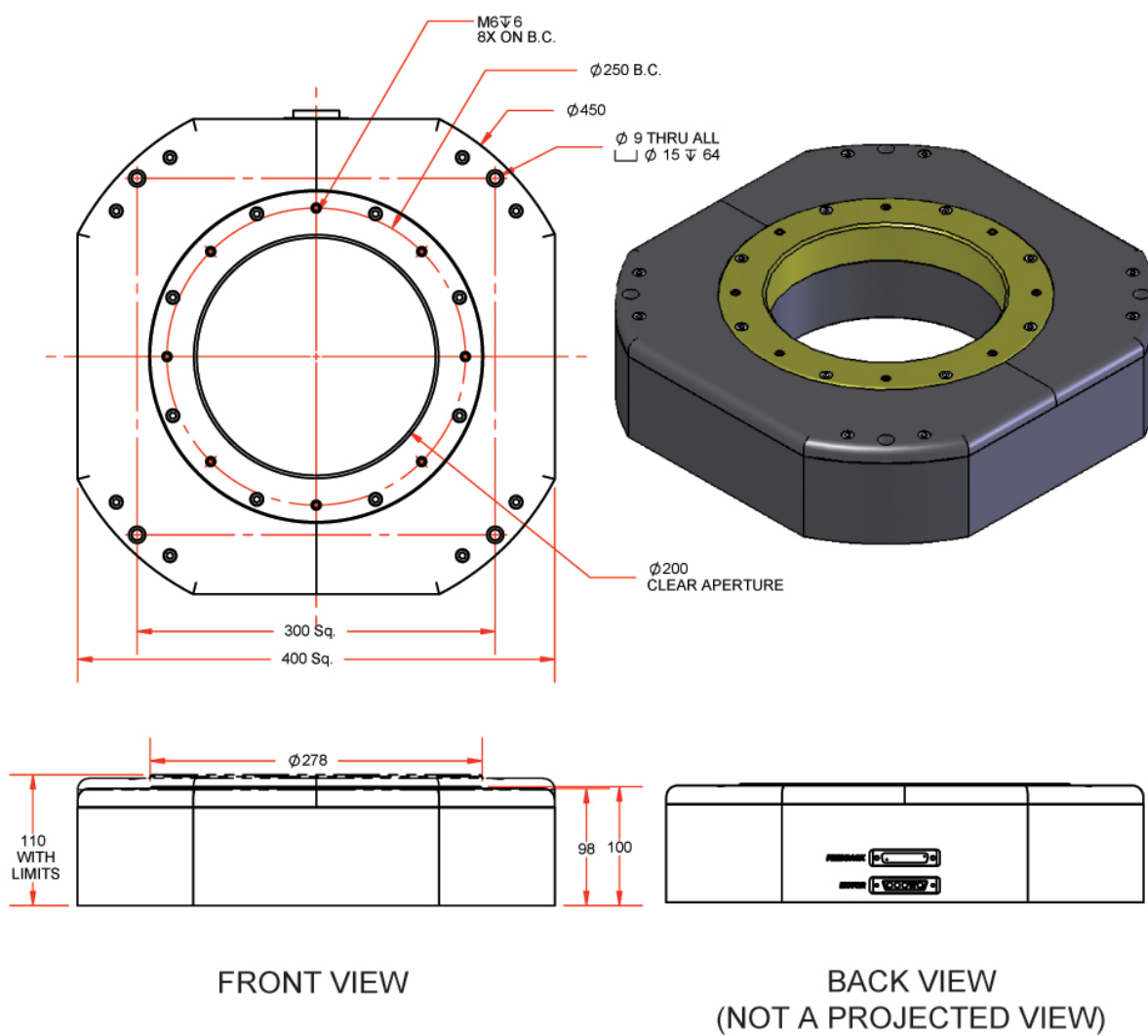


Figure 1-6: ALAR-200-LP Dimensions

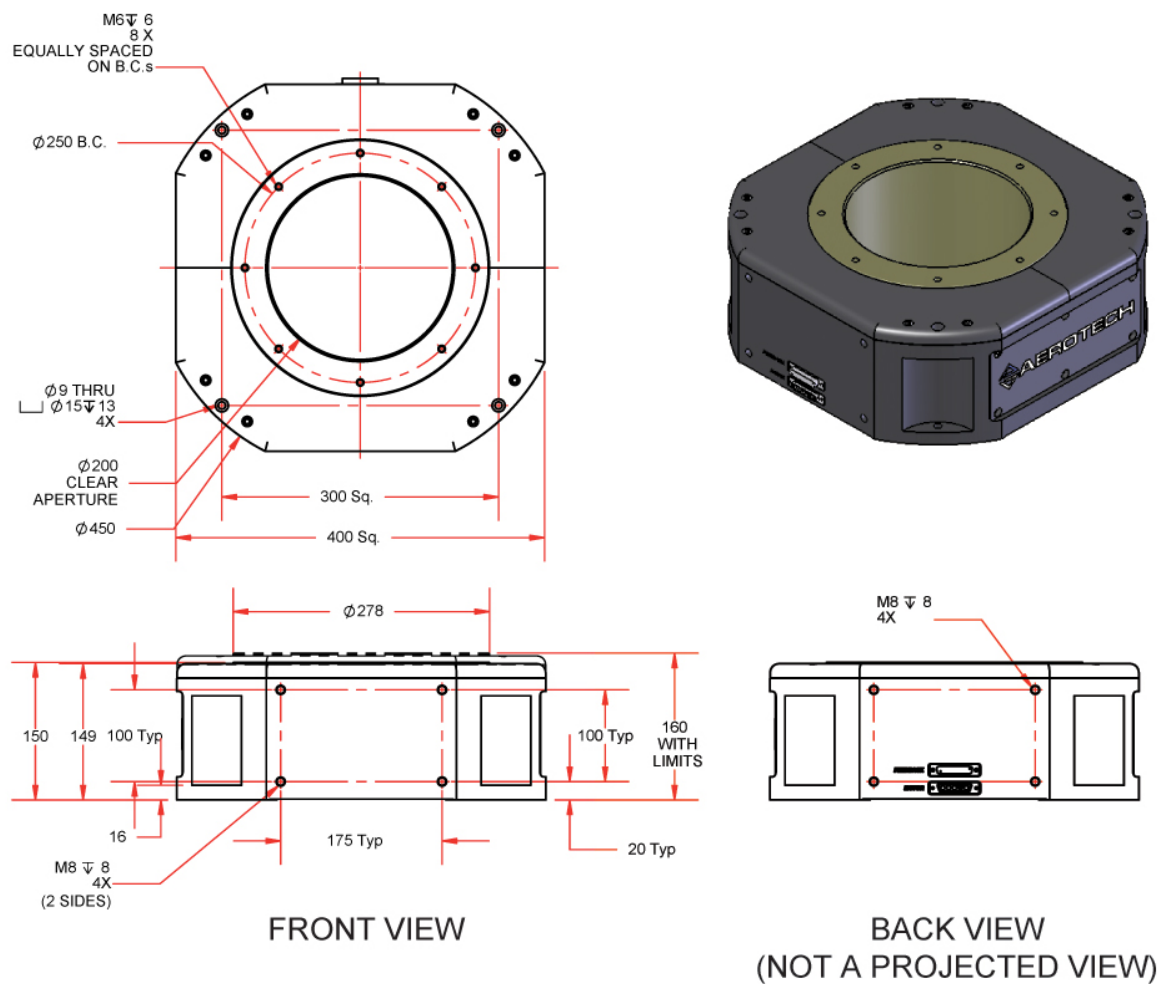


Figure 1-7: ALAR-200-SP Dimensions

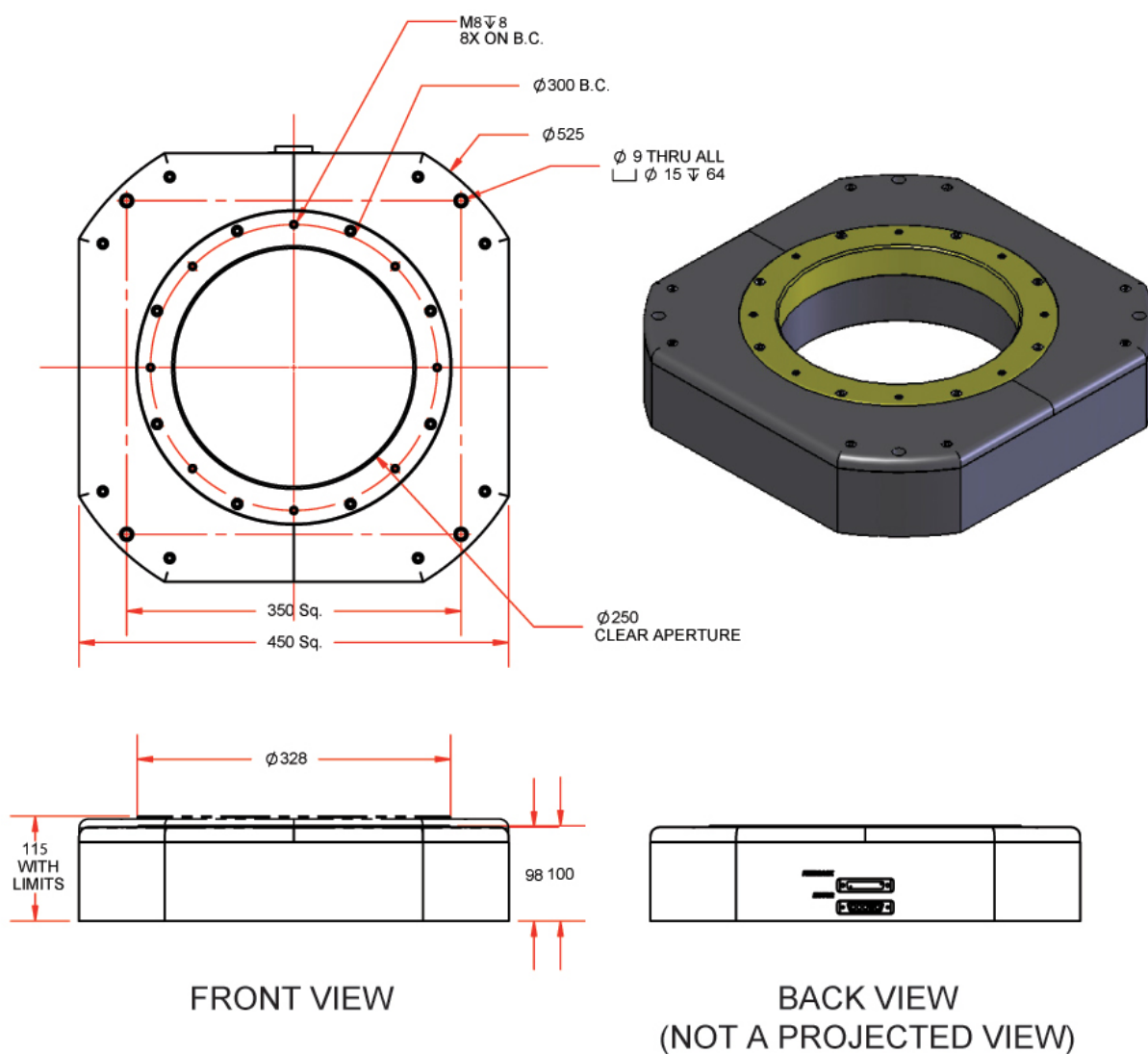


Figure 1-8: ALAR-250-LP Dimensions

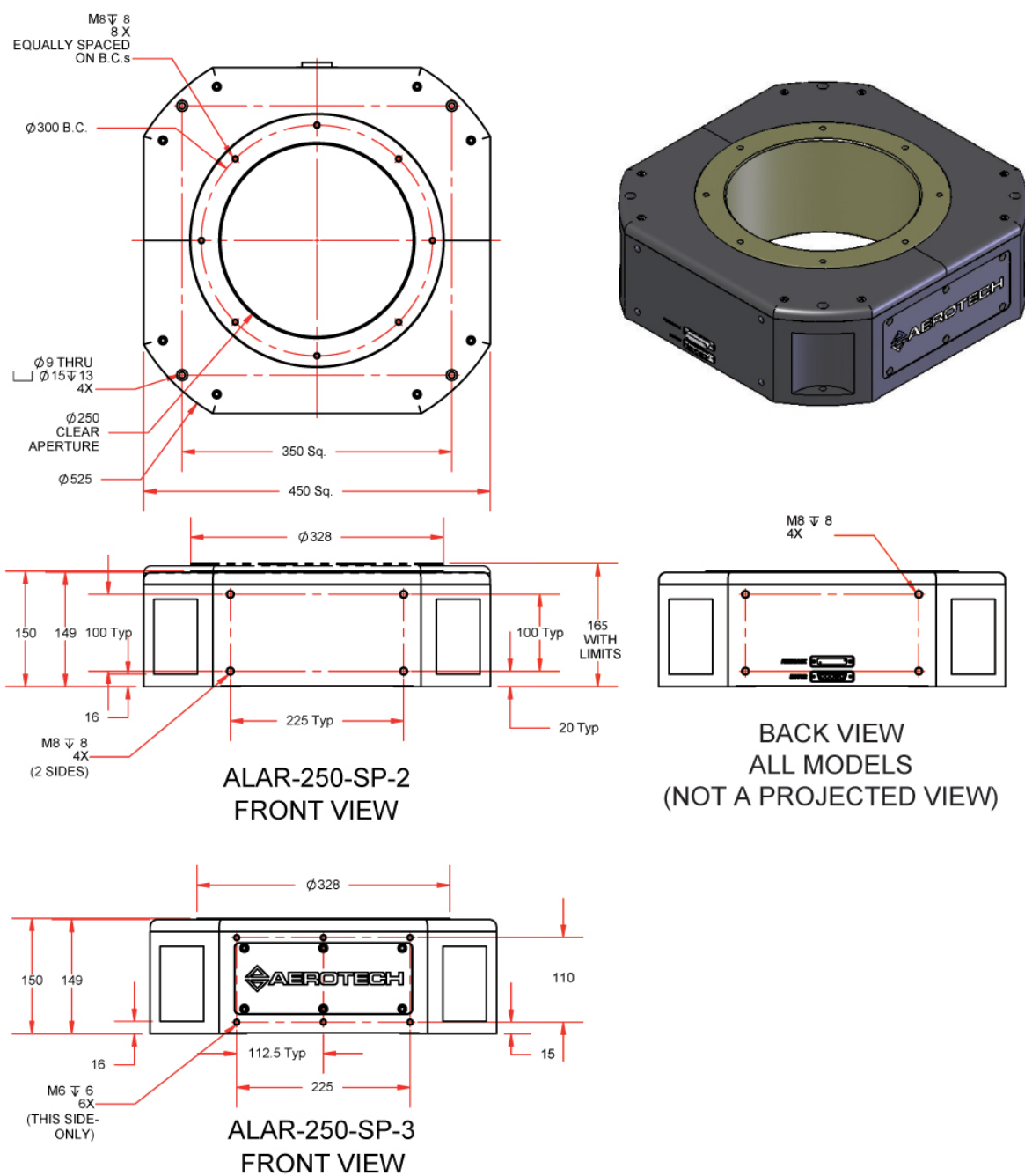


Figure 1-9: ALAR-250-SP Dimensions

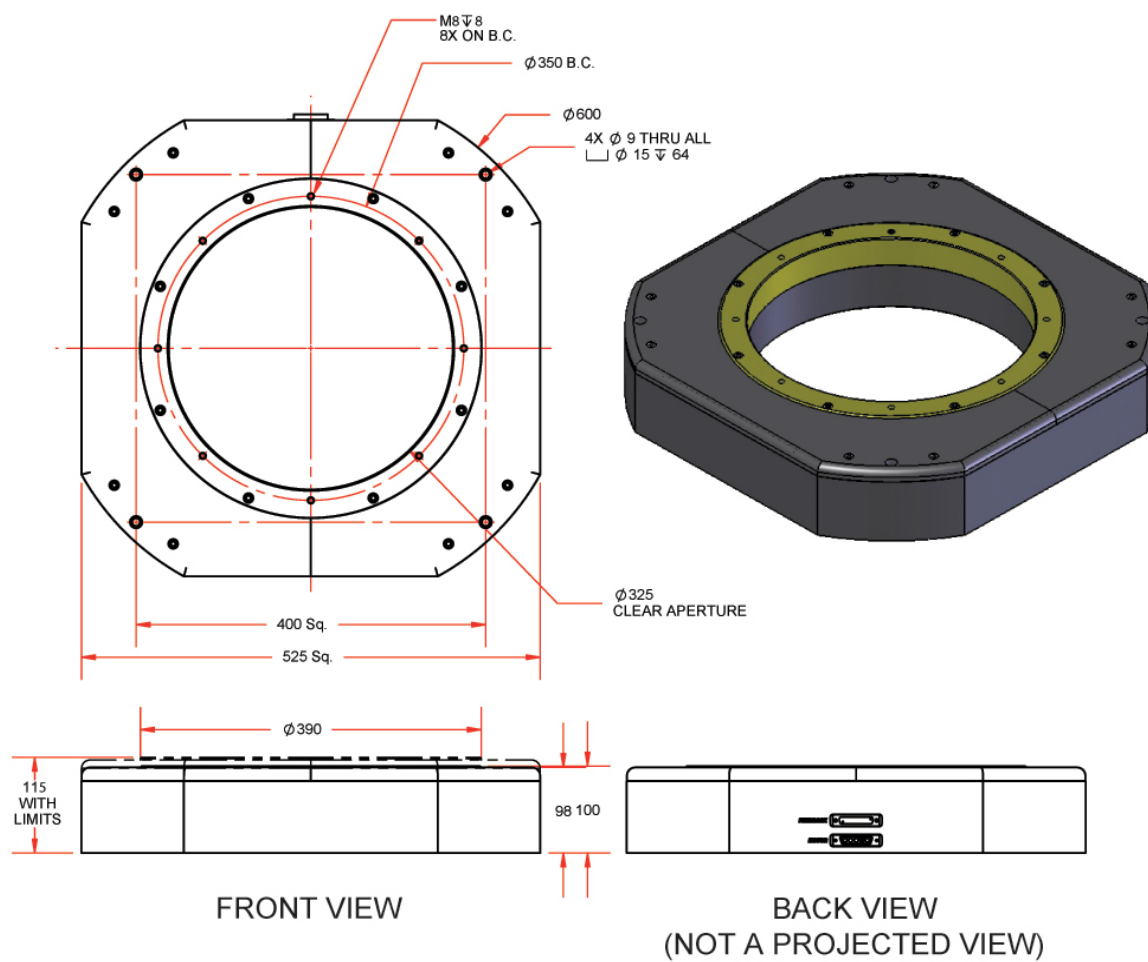


Figure 1-10: ALAR-325-LP Dimensions

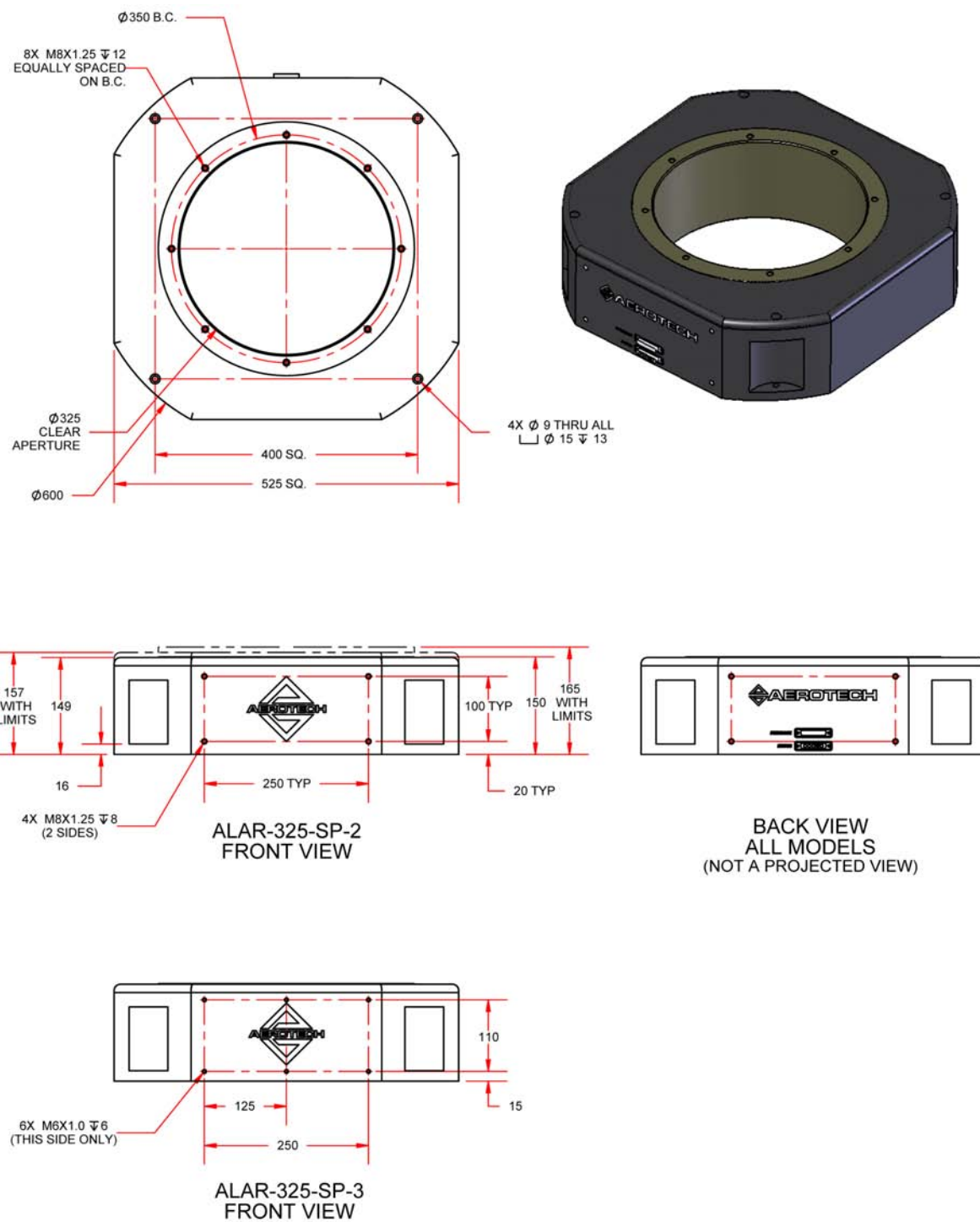


Figure 1-11: ALAR-325-SP Dimensions

1.5. Safety Procedures and Warnings

The following statements apply throughout this manual. Failure to observe these precautions could result in serious injury to those performing the procedures and damage to the equipment.

This manual and any additional instructions included with the stage should be retained for the lifetime of the stage.



DANGER

To minimize the possibility of electrical shock and bodily injury or death, disconnect all electrical power prior to making any electrical connections.



DANGER

To minimize the possibility of electrical shock and bodily injury or death when any electrical circuit is in use, ensure that no person comes in contact with the circuitry when the stage is connected to a power source.



DANGER

To minimize the possibility of bodily injury or death, disconnect all electrical power prior to making any mechanical adjustments.



DANGER

Moving parts of the stage can cause crushing or shearing injuries. All personnel must remain clear of any moving parts.



WARNING

Improper use of the stage can cause damage, shock, injury, or death. Read and understand this manual before operating the stage.



WARNING

If the stage is used in a manner not specified by the manufacturer, the protection provided by the stage can be impaired.



WARNING

Stage cables can pose a tripping hazard. Securely mount and position all stage cables to avoid potential hazards.

**WARNING**

Do not expose the stage to environments or conditions outside the specified range of operating environments. Operation in conditions other than those specified can cause damage to the equipment.

**WARNING**

The stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.

**WARNING**

Use care when moving the stage. Manually lifting or transporting stages can result in injury.

**WARNING**

Only trained personnel should operate, inspect, and maintain the stage.

**WARNING**

This stage is intended for light industrial manufacturing or laboratory use. Use of the stage for unintended applications can result in injury and damage to the equipment.

**WARNING**

Before using this stage, perform an operator risk assessment to determine the needed safety requirements.

1.6. EC Declaration of Incorporation

Manufacturer: Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238
USA



herewith declares that the product:

Aerotech, Inc. ALAR Stage

is intended to be incorporated into machinery to constitute machinery covered by the Directive 2006/42/EC as amended;

does therefore not in every respect comply with the provisions of this directive;

and that the following harmonized European standards have been applied:

EN ISO 12100-1,-2:2003+A1:2009

Safety of machinery - Basic concepts, general principles for design

ISO 14121-1:2007

Safety of machinery - Risk assessment - Part 1: Principles

EN 60204-1:2005

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

and further more declares that

it is not allowed to put the equipment into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of the Directive 2006/42/EC and with national implementing legislation, i.e. as a whole, including the equipment referred to in this Declaration.

Authorized Representative:

Manfred Besold

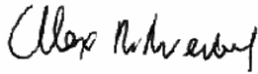
Address:

AEROTECH GmbH

Süd-West-Park 90

D-90449 Nürnberg

Name:

Alex Weibel / 
Engineer Verifying Compliance

Position:

Location:

Pittsburgh, PA

Date:

April 18, 2011

Chapter 2: Installation

This chapter describes the installation procedure for the ALAR stage, including handling the stage properly, preparing the mounting surface to accept the stage, securing the stage to the mounting surface, attaching the payload, and making the electrical connections.



Installation must follow the instructions in this chapter. Failure to follow these instructions could result in injury and damage to the equipment.

2.1. Unpacking and Handling the Stage

Carefully remove the stage from the protective shipping container. Before operating the stage, it is important to let the stage stabilize at room temperature for at least 12 hours. It is important to clean the stage by blowing it off with pressurized nitrogen or clean, oil-less air.

Lift the stage by the factory installed eye bolts (if provided, typically on 200, 250, and 325 models). Smaller stages can be lifted by their sides.

Each stage has a label listing the system part number and serial number. These numbers contain information necessary for maintaining or updating system hardware and software. Locate this label and record the information for later reference. If any damage has occurred during shipping, report it immediately.



Improper stage handling could adversely affect the stage's performance. Therefore, use care when moving the stage. Manually lifting or transporting stages can result in injury.



Lift the stage only by the base. Do not use the tabletop or wiring connections to support the stage.

2.2. Preparing the Mounting Surface

The mounting surface should be flat and have adequate stiffness in order to achieve the maximum performance from the ALAR. When an ALAR series stage is mounted to a non-flat surface, the stage can be distorted as the mounting screws are tightened. This distortion will decrease the overall accuracy of the stage.



To maintain accuracy, the mounting surface should be flat within 1 μm per 50 mm.

Adjustments to the mounting surface must be done before the stage is secured. The effects of flatness on mounting are illustrated in Figure 2-1.

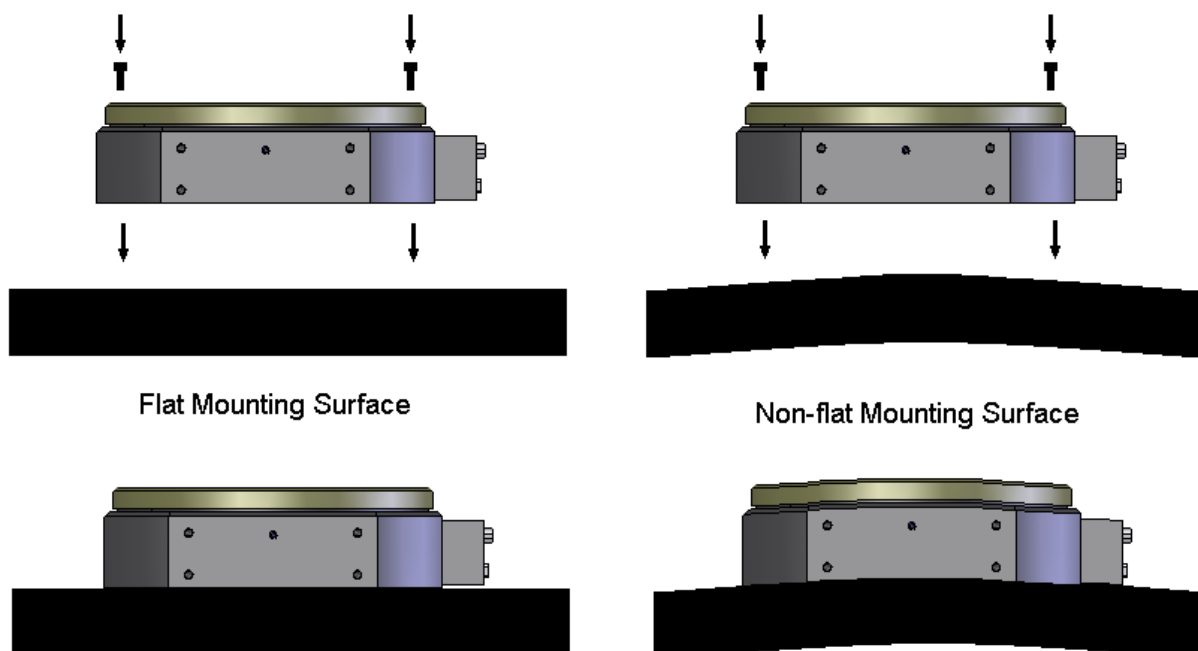


Figure 2-1: Results of Flat Versus Non-Flat Mounting

NOTE: The stage base is precision machined and verified for flatness prior to stage assembly at the factory. If machining is required to achieve the desired flatness, it should be performed on the mounting surface rather than the stage base. Shimming should be avoided if possible. If shimming is required, it should be minimized to improve the rigidity of the system.

2.3. Securing the Stage to the Mounting Surface

ALAR series stages have a fixed mounting pattern available to secure the stage to a mounting surface. Figure 2-2 shows the main mounting holes in the base of the stage. These counter-bored holes are designed for M6 socket head cap screws for the 150 and smaller models and M8 socket head cap screws for the 200 and larger models.



The stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.

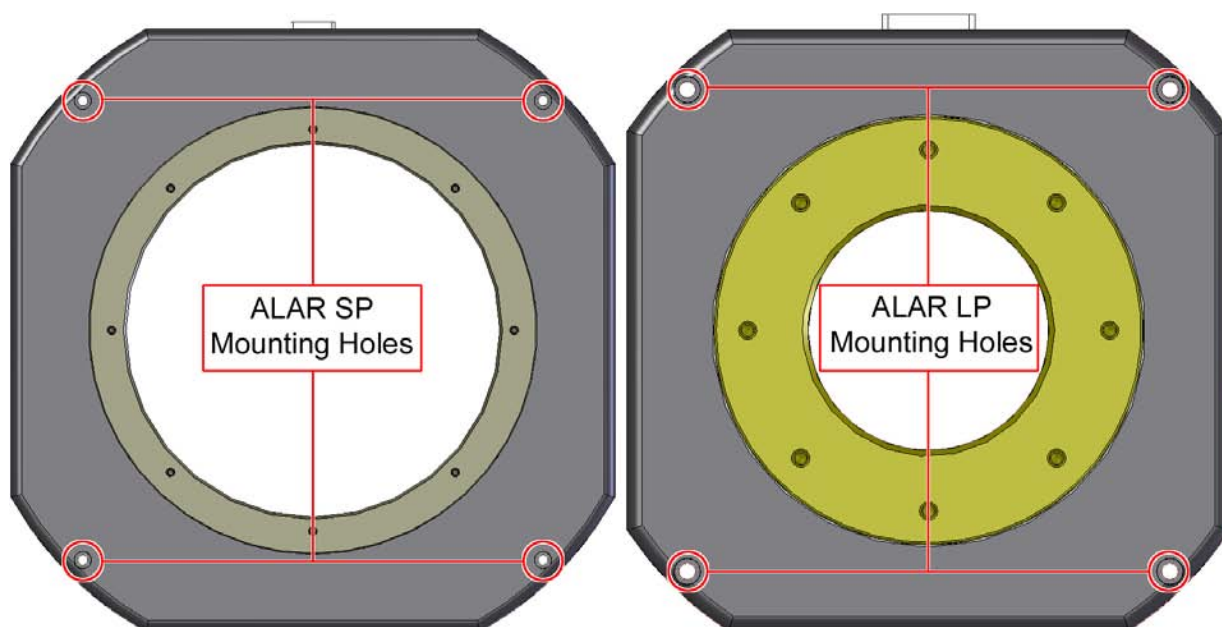


Figure 2-2: View of an ALAR Stage Showing Mounting Holes

2.4. Attaching the Payload to the Stage

To prevent damage to the stage or parts, test the operation of the stage before any payload is mounted to the stage tabletop. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical connections, refer to the Electrical Installation section later in this chapter and the documentation of the motion control system delivered with the stage.

For all limited travel (-LT) ALAR stages, there are two sets of eight patterned mounting holes. These patterns are identical but are separated by 14 degrees. Although mounting to either pattern is acceptable, the recommended payload mounting holes depend on whether the stage is a standard profile (-SP) or a low profile (-LP) configuration.

The recommended hole pattern for payload mounting in all ALAR-**SP**-LT stages is indicated with green circles in Figure 2-3. These mounting holes are located nearest to the socket head cap screws (SHCS).

The recommended hole pattern for payload mounting in all ALAR-**LP**-LT stages is indicated with blue squares in Figure 2-3. These mounting holes are located about halfway between the socket head cap screws.

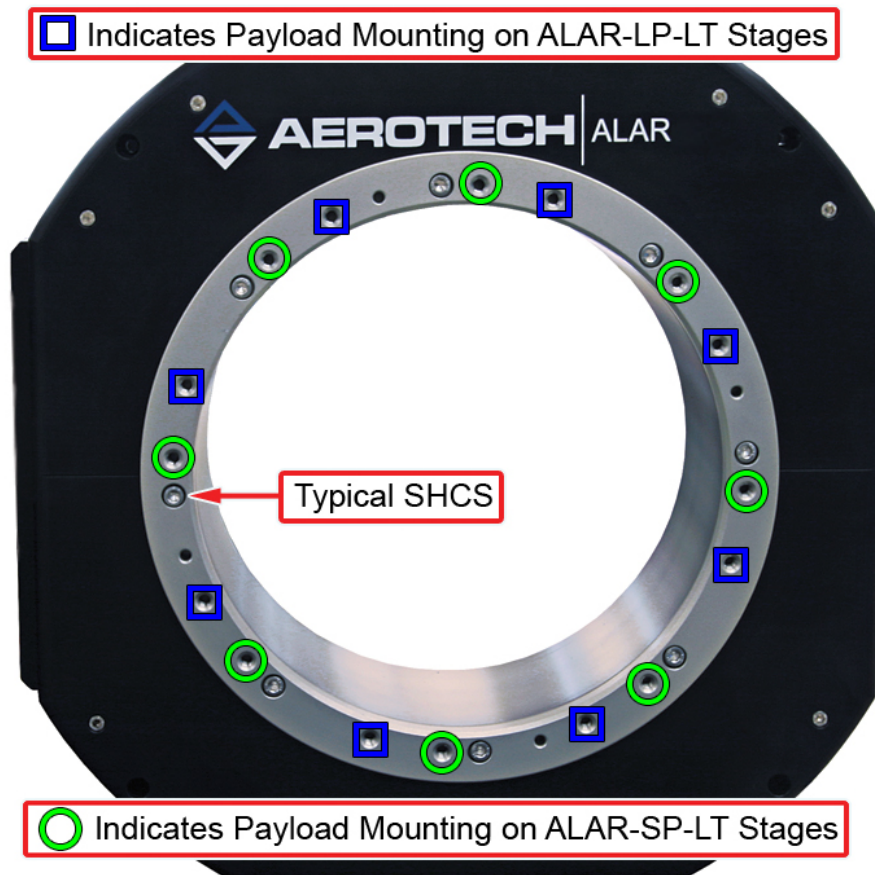


Figure 2-3: Payload Mounting Holes on ALAR-SP-LT and ALAR-LP-LT Limited Travel Stages

2.5. Electrical Installation

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ALAR series stage is part of a complete Aerotech motion control system, setup involves connecting a stage and motor combination to the appropriate drive chassis with the cables provided. Connect the provided cables to the motor and feedback connectors on the stage. Labels on the drive indicate the appropriate connections. Refer to your drive manuals and documentation for additional installation and operation information. In some cases, if the system is uniquely configured, a drawing showing system interconnects is supplied.



WARNING

Never connect or disconnect any electrical component or connecting cable while power is applied, or serious damage can result.



WARNING

The stage's protective ground is located on pin A4 of the motor connector. If you are using cables other than those provided by Aerotech, you must connect pin A4 to a ground connection.

NOTE: Refer to controller documentation regarding adjusting servo gains for optimum velocity and position stability.

Chapter 3: Operating Specifications

This chapter contains general technical information about ALAR series stages. Included are basic product specifications and general information on limit switches and motor wiring.

3.1. Environmental Specifications

The environmental specifications for the ALAR are listed in the following table.

Table 3-1: Environmental Specifications

Ambient Temperature	Operating: 10° to 35° C (50° to 95° F) The optimal operating temperature is 20° C \pm 2° C (68° F \pm 4° F). If at any time the operating temperature deviates from 20° C degradation in performance could occur. Contact Aerotech for information regarding your specific application and environment.
	Storage: 0° to 40° C (32° to 104° F) in original shipping packaging
Humidity	Operating: 40 percent to 60 percent RH The optimal operating humidity is 50 percent RH.
	Storage: 30 percent to 60 percent RH, non-condensing in original packaging
Altitude	Operating: 0 to 2,000 m (0 to 6,562 ft) above sea level Contact Aerotech if your specific application involves use above 2,000 m or below sea level.
Vibration	Use the system in a low vibration environment. Excessive floor or acoustical vibration can affect stage and system performance. Contact Aerotech for information regarding your specific application.
Dust Exposure	The ALAR stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Indoor use only



Do not expose the stage to environments or conditions outside the specified range of operating environments. Operation in conditions other than those specified can cause damage to the equipment.

3.2. Basic Specifications

The ALAR series rotary stage specifications are shown in Table 3-2. Table 3-3 gives standard motor specifications.

Table 3-2: ALAR Series Specifications

Basic Model	ALAR-100-SP	ALAR-100-LP	ALAR-150-SP
Total Travel	360° Continuous, Limited up to 340°		
Aperture Diameter	100 mm (3.94 in)		150 mm (5.91 in)
Length	250 mm (9.84 in)		300 mm (11.81 in)
Width	250 mm (9.84 in)		300 mm (11.81 in)
Height	100 mm (3.94 in)	65 mm (2.56 in)	100 mm (3.94 in)
Mechanical Drive System	Direct-Drive Brushless Slotless Servomotor		
Maximum Acceleration	1364 rad/s ²	1009 rad/s ²	1330 rad/s ²
Accuracy ⁽¹⁾	±18.9 µrad (±3.9 arc-sec)		
Repeatability	±2.4 µrad (±0.5 arc-sec)		
Maximum Rotary Speed ⁽²⁾	300 rpm	50 rpm	250 rpm
Resolution	0.1 µrad (0.02 arc sec)		0.08 µrad (0.016 arc sec)
Maximum Axial Load Capability	1550 N (348 lb)	1175 N (264 lb)	1950 N (438 lb)
Maximum Radial Load Capability	1350 N (303 lb)	950 N (214 lb)	1925 N (433 lb)
Maximum Moment Load Capability	250 N-m	150 N-m	450 N-m
Tilt Error Motion	9.7 µrad		
Standard Finish	Black Anodize with Hard-Coated Table Top		
Weight	160 N (36 lb)	81 N (18.1 lb)	182 N (41 lb)
Weight with Limits	167 N (37.5 lb)	87 N (19.6 lb)	192 N (43.2 lb)
Inertia ⁽³⁾	0.022 kg•m ²	0.022 kg•m ²	0.040 kg•m ²
(1) ±18.9 µrad calibrated (HALAR); ±100 µrad uncalibrated.			
(2) Maximum speed based on stage capability; maximum application velocity may be limited by system data rate, resolution and bus voltage.			
(3) Unloaded inertia.			

Table 3-2: ALAR Series Specifications (continued)

Basic Model	ALAR-150-LP	ALAR-200-SP	ALAR-200-LP
Total Travel	360° Continuous, Limited up to 340°		
Aperture Diameter	150 mm (5.91 in)	200 mm (7.87 in)	
Length	300 mm (11.81 in)	400 mm (15.75 in)	
Width	300 mm (11.81 in)	400 mm (15.75 in)	
Height	65 mm (2.56 in)	150 mm (5.91 in)	100 mm (3.94 in)
Mechanical Drive System	Direct-Drive Brushless Slotless Servomotor		
Maximum Acceleration	829 rad/s ²	361 rad/s ²	570 rad/s ²
Accuracy ⁽¹⁾	±18.9 µrad (±3.9 arc-sec)		
Repeatability	±2.4 µrad (±0.5 arc-sec)		
Maximum Rotary Speed ⁽²⁾	45 rpm	90 rpm	90 rpm
Resolution	0.09 µrad (0.018 arc sec)	0.06 µrad (0.012 arc sec)	0.07 µrad (0.014 arc sec)
Maximum Axial Load Capability	1325 N (298 lb)	4675 N (1051 lb)	4350 N (978 lb)
Maximum Radial Load Capability	1275 N (287 lb)	4775 N (1073 lb)	4125 N (927 lb)
Maximum Moment Load Capability	225 N-m	1600 N-m	1075 N-m
Tilt Error Motion	9.7 µrad		
Standard Finish	Black Anodize with Hard-Coated Table Top		
Weight	96 N (21.6 lb)	396 N (89 lb)	277 N (62.3 lb)
Weight with Limits	106 N (23.8 lb)	423 N (95 lb)	295 N (66.4 lb)
Inertia ⁽³⁾	0.031 kg•m ²	0.32 kg•m ²	0.19 kg•m ²
(1) ±18.9 µrad calibrated (HALAR); ±100 µrad uncalibrated.			
(2) Maximum speed based on stage capability; maximum application velocity may be limited by system data rate, resolution and bus voltage.			
(3) Unloaded inertia.			

Table 3-2: ALAR Series Specifications (continued)

Basic Model	ALAR-250-SP-2	ALAR-250-SP-3	ALAR-250-LP
Total Travel	360° Continuous, Limited up to 340°		
Aperture Diameter	250 mm (9.84 in)		
Length	450 mm (17.72 in)		
Width	450 mm (17.72 in)		
Height	150 mm (5.91 in)		100 mm (3.94 in)
Mechanical Drive System	Direct-Drive Brushless Slotless Servomotor		
Maximum Acceleration	191 rad/s ²	287 rad/s ²	407 rad/s ²
Accuracy ⁽¹⁾	±18.9 μrad (±3.9 arc-sec)		
Repeatability	±2.4 μrad (±0.5 arc-sec)		
Maximum Rotary Speed ⁽²⁾	90 rpm	140 rpm	90 rpm
Resolution	0.05 μrad (0.01 arc sec)		
Maximum Axial Load Capability	4950 N (1113 lb)		4950 N (1113 lb)
Maximum Radial Load Capability	5200 N (1169 lb)		5050 N (1135 lb)
Maximum Moment Load Capability	1825 N-m		1475 N-m
Tilt Error Motion	9.7 μrad		
Standard Finish	Black Anodize with Hard-Coated Table Top		
Weight	503 N (113 lb)		343 N (77.1 lb)
Weight with Limits	534 N (120 lb)		367 N (82.6 lb)
Inertia ⁽³⁾	0.50 kg•m ²		0.31 kg•m ²
(1) ±18.9 μrad calibrated (HALAR); ±100 μrad uncalibrated.			
(2) Maximum speed based on stage capability; maximum application velocity may be limited by system data rate, resolution and bus voltage.			
(3) Unloaded inertia.			

Table 3-2: ALAR Series Specifications (continued)

Basic Model	ALAR-325-SP-2	ALAR-325-SP-3	ALAR-325-LP
Total Travel	360° Continuous, Limited up to 340°		
Aperture Diameter	325 mm (12.80 in)		
Length	525 mm (20.67 in)		
Width	525 mm (20.67 in)		
Height	150 mm (5.91 in)		100 mm (3.94 in)
Mechanical Drive System	Direct-Drive Brushless Slotless Servomotor		
Maximum Acceleration	123 rad/s ²	185 rad/s ²	339 rad/s ²
Accuracy ⁽¹⁾	±18.9 μrad (±3.9 arc-sec)		
Repeatability	±2.4 μrad (±0.5 arc-sec)		
Maximum Rotary Speed ⁽²⁾	120 rpm	150 rpm	120 rpm
Resolution	0.04 μrad (0.009 arc sec)		
Maximum Axial Load Capability	5825 N (1310 lb)		5825 N (1310 lb)
Maximum Radial Load Capability	6650 N (1495 lb)		6450 N (1450 lb)
Maximum Moment Load Capability	2650 N-m		2200 N-m
Tilt Error Motion	9.7 μrad		
Standard Finish	Black Anodize with Hard-Coated Table Top		
Weight	600 N ⁽⁴⁾ (135 lb)		436 N (98 lb)
Weight with Limits	636 N (143 lb)		489 N (110 lb)
Inertia ⁽³⁾	1.0 kg•m ²		0.55 kg•m ²

(1) ±18.9 μrad calibrated (HALAR); ±100 μrad uncalibrated.

(2) Maximum speed based on stage capability; maximum application velocity may be limited by system data rate, resolution and bus voltage.

(3) Unloaded inertia.

(4) Specified weight is an estimate.

Table 3-3: Motor Specifications

Model		ALAR-100-SP	ALAR-100-LP	ALAR-150-SP
Performance Specifications				
Stall Torque, Continuous	N-m	6.0	2.0	10.7
Peak Torque	N-m	24	11.7	42.9
Electrical Specifications				
BEMF Constant (line to line, max)	V/krpm	268.7	42.2	209.4
Continuous Current, No Cooling	A, pk	2.7	5.8	6.2
	A, rms	1.9	4.1	4.4
Peak Current, Stall	A, pk	10.8	33.5	24.8
	A, rms	7.6	23.7	17.5
Force Constant, Sinusoidal Drive	N-m/A, pk	2.22	0.35	1.73
	N-m/A, rms	3.14	0.5	2.45
Motor Constant	N-m/ \sqrt{W}	0.63	0.16	0.85
Resistance, 25 C (line to line)	Ohms	12.8	4.5	4.3
Inductance (line to line)	mH	3.40	0.55	2.15
Thermal Resistance, No Cooling	$^{\circ}\text{C/W}$	0.82	0.65	0.47
Maximum Bus Voltage	Vdc	340	340	340
Mechanical Specifications				
Motor Radius	mm	90	90	120
Magnetic Pole Pitch	deg	20	10	14
Pole per Rev		18	36	26

Table 3-3: Motor Specifications (continued)

Model		ALAR-150-LP	ALAR-200-SP	ALAR-200-LP
Performance Specifications				
Stall Torque, Continuous	N-m	2.6	12.9	
Peak Torque	N-m	15.4	85.0	
Electrical Specifications				
BEMF Constant (line to line, max)	V/krpm	58.9	293.9	
Continuous Current, No Cooling	A, pk	5.4	5.3	
	A, rms	3.8	3.8	
Peak Current, Stall	A, pk	31.4	34.8	
	A, rms	22.2	24.6	
Force Constant, Sinusoidal Drive	N-m/A, pk	0.49	2.44	
	N-m/A, rms	0.69	3.45	
Motor Constant	N-m/ \sqrt{W}	0.21	0.84	
Resistance, 25 C (line to line)	Ohms	5.1	8.0	
Inductance (line to line)	mH	0.63	6.40	
Thermal Resistance, No Cooling	°C/W	0.64	0.42	
Maximum Bus Voltage	Vdc	340	340	
Mechanical Specifications				
Motor Radius	mm	110	150	
Magnetic Pole Pitch	deg	8.18	12	
Pole per Rev		44	30	

Table 3-3: Motor Specifications (continued)

Model		ALAR-250-SP-2	ALAR-250-SP-3	ALAR-250-LP
Performance Specifications				
Stall Torque, Continuous	N-m	14.1	21.1	15.1
Peak Torque	N-m	92.3	138.5	99.1
Electrical Specifications				
BEMF Constant (line to line, max)	V/krpm	319.4	319.4	342.9
Continuous Current, No Cooling	A, pk	5.3	8.0	5.3
	A, rms	3.8	5.6	3.8
Peak Current, Stall	A, pk	34.8	52.2	34.8
	A, rms	24.6	36.8	24.6
Force Constant, Sinusoidal Drive	N-m/A, pk	2.6	2.6	2.8
	N-m/A, rms	3.8	3.8	4.0
Motor Constant	N-m/ \sqrt{W}	0.92	1.12	0.98
Resistance, 25 C (line to line)	Ohms	8.0	5.3	8.0
Inductance (line to line)	mH	6.4	4.3	6.4
Thermal Resistance, No Cooling	°C/W	0.42	0.28	0.42
Maximum Bus Voltage	Vdc	340	340	340
Mechanical Specifications				
Motor Radius	mm	163		175
Magnetic Pole Pitch	deg	10.59		10
Pole per Rev		34		36

Table 3-3: Motor Specifications (continued)

Model		ALAR-325-SP-2	ALAR-325-SP-3	ALAR-325-LP
Performance Specifications				
Stall Torque, Continuous	N-m	23.4	35.1	23.4
Peak Torque	N-m	143.3	214.9	143.3
Electrical Specifications				
BEMF Constant (line to line, max)	V/krpm	552.8	552.8	552.8
Continuous Current, No Cooling	A, pk	5.1	7.6	5.1
	A, rms	3.6	5.4	3.6
Peak Current, Stall	A, pk	31.2	46.8	31.2
	A, rms	22.1	33.1	22.1
Force Constant, Sinusoidal Drive	N-m/A, pk	4.6	4.6	4.6
	N-m/A, rms	6.5	6.5	6.5
Motor Constant	N-m/ \sqrt{W}	1.4	1.7	1.4
Resistance, 25 C (line to line)	Ohms	10.6	7.1	10.6
Inductance (line to line)	mH	8.4	5.6	8.4
Thermal Resistance, No Cooling	°C/W	0.35	0.23	0.35
Maximum Bus Voltage	Vdc	340	340	340
Mechanical Specifications				
Motor Radius	mm	211		
Magnetic Pole Pitch	deg	8.18		
Pole per Rev		44		

3.3. Standard Motor Wiring

Stages come from the factory completely wired and assembled. For reference, connector pin outputs (pin-outs) and general wiring information are given in the following figures. Pinouts are defined in Table 3-4 and Table 3-6.

NOTE: Refer to the other documentation accompanying your Aerotech equipment. Call your Aerotech representative if there are any questions on system configuration.

NOTE: If you are using your own cables to connect the stage, ensure that motor and ground wires can handle current higher than the continuous current listed in Table 3-3. The voltage rating of the wire insulation must be greater than the bus voltage listed in Table 3-3.

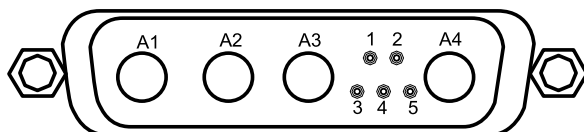


Figure 3-1: Motor Power Connector

Table 3-4: High Power D-Style Motor Connector Pin Assignment

Pin #	Pin Output	Description
A1	MTR ØA	Motor Phase A
A2	MTR ØB	Motor Phase B
A3	MTR ØC	Motor Phase C
1	MTR SHLD	Shield for motor wiring connector
2	Reserved	Reserved
3	Reserved	Reserved
4	Reserved	Reserved
5	Reserved	Reserved
A4	FRM GND	Ground to stage base

Table 3-5: High Power D-Style Mating Connector

	Aerotech P/N	3d Party P/N
Backshell	ECK656	Amphenol #17-1726-2
Sockets	ECK659	ITT Cannon #DM53744-6
Connector	ECK657	ITT Cannon #DBMM9W4S

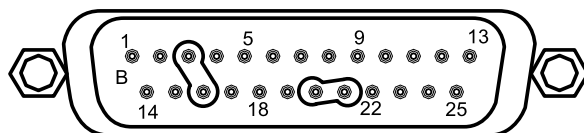


Figure 3-2: Motor Feedback Connector

Table 3-6: Motor Feedback Connector Pin Assignment (D-Style Connector)

Pin #	Pin Output	Description
1	SIG SHLD	Shield for feedback connector
2	TH+	Positive lead for motor thermistor (to motion controller)
3	ENC +5V	+5 V supply input for optical encoders. Typical requirement is 250 mA.
5	HALL B	Hall Effect B. Brushless motor commutation track output. TTL line driven signal with rotary motor.
6	MKR-N	Marker N. Incremental encoder output; either the complement of Marker with a line driven, TTL type encoder or 2.5 V DC bias level with amplified sine wave type encoder.
7	MKR	Marker. Incremental encoder output pulse given once per revolution. Typically used for home reference cycle.
10	HALL A	Hall Effect A. Brushless motor commutation track output. TTL line driven signal with rotary motor.
11	HALL C	Hall Effect C. Brushless motor commutation track output. TTL line driven signal with rotary motor.
12	CW/+ LMT	Clockwise end of travel limit (option)
14	COS	Cosine. Incremental encoder output; either TTL line driven or amplified sine wave type signal. COS leads SIN for CW motor rotation.
15	COS-N	Incremental encoder output. Complement of cos.
16	LMT +5V	+5 V supply for limit switch
17	SIN	Sine. Incremental encoder output; either TTL line driven or amplified sine wave type signal. COS leads SIN for CW motor rotation.
18	SIN-N	Incremental encoder output. Complement of sine.
20	LMT COM	Common ground for limit switch
21	ENC COM	+ 5 V return for optical encoders (ground).
24	CW/-LMT	Counterclockwise end of travel limit (option)

Table 3-7: Motor Feedback Connector Mating Connector

	Aerotech P/N	3d Party P/N
Backshell	ECK656	Amphenol #17-1726-2
Connector	ECK300	Cinch DB-255

3.4. Limit Switch Wiring

NOTE: This section applies only to limited travel models. Continuous travel models do not have this feature.

Hall-effect limit switches are provided with all limited travel ALAR series stages. The limit switch signals when the stage has reached its maximum useable travel distance in all directions. The limit switch is mounted to a small circuit board within the stage and two magnets, used as triggers, are mounted to the bottom of the stage table.



If the stage is driven approximately 3° beyond the electrical limit, it will encounter a mechanical stop. Although the operating speed of the stage may be relatively slow, damage to the stage could result.

3.4.1. Limit Switch Operation (Option)

The limit switch is mounted on a small printed circuit board. ALAR Stages with the limit option include limit switch wiring integrated into the main wiring connector. Limit switches on ALAR series stages are configured normally-closed. The input to the controller is seen as a logic 0 (typical 0.4V at 12.8 mA) when no limit condition is present. When the limit switch is activated, a 5V source through a pull-up resistor causes a logic 1 (typically 4.8-5V) to be seen by the controller input.

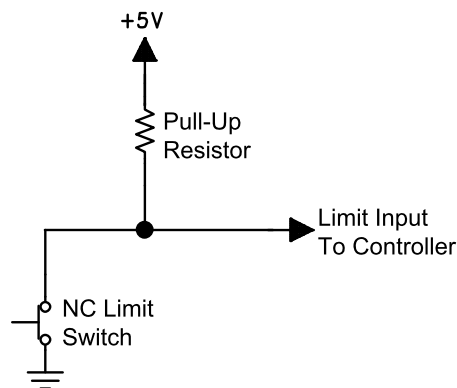


Figure 3-3: Limit Switch Wiring

3.5. Vacuum Operation

Contact the factory for information regarding operation in a vacuum environment.

Chapter 4: Maintenance

The ALAR series stages are designed to be maintenance-free positioning systems.



To minimize the possibility of bodily injury, confirm that all electrical power is disconnected prior to making any mechanical adjustments.

4.1. Service and Inspection Schedule

It is recommended that the ALAR stage be inspected once per month until a trend develops for the specific application and environment.

4.2. Cleaning and Lubrication

There are no elements of the ALAR that require added lubrication. The bearings, motors, and encoders for the ALAR series require no added lubrication or maintenance. Periodic cleaning is recommended.

4.2.1. Recommended Cleaning Solvents

Before using a cleaning solvent on any part of the stage, it is recommended that compressed nitrogen or clean, dry air be used to blow away small particles and dust. Any metal surface of the stage may be cleaned with isopropyl alcohol on a lint-free cloth. Avoid getting excess cleaning solvent on the surfaces, as it could damage the delicate electronics inside.



To minimize the possibility of bodily injury, confirm that all electrical power is disconnected prior to making any mechanical adjustments.

Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, where or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability or any claim for loss or damage arising out of the sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Aerotech, Inc. warrants its laser products to the original purchaser for a minimum period of one year from date of shipment. This warranty covers defects in workmanship and material and is voided for all laser power supplies, plasma tubes and laser systems subject to electrical or physical abuse, tampering (such as opening the housing or removal of the serial tag) or improper operation as determined by Aerotech. This warranty is also voided for failure to comply with Aerotech's return procedures.

Laser Products

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within (30) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. Any returned product(s) must be accompanied by a return authorization number. The return authorization number may be obtained by calling an Aerotech service center. Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than (30) days after the issuance of a return authorization number will be subject to review.

Return Procedure

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an airfreight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Returned Product Warranty Determination

After Aerotech's examination, the buyer shall be notified of the repair cost. At such time, the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within (30) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Returned Product Non-warranty Determination

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

Rush Service

On-site Warranty Repair If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special service rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-warranty Repair If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Company Address Aerotech, Inc.
101 Zeta Drive
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Phone: (412) 963-7470

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Appendix B: Technical Changes

Table B-1: Current Changes (1.06.00)

Section(s) Affected	General Information
Section 3.2.	Updated motor and stage specifications

Table B-2: Archived Changes

Revision	Section(s) Affected	General Information
1.05.00	Section 1.6.	Added section
1.05.00	Section 3.1.	Added section
1.05.00	Chapter 2: Installation, Section 2.1. , Section 2.3. , Section 2.5. , and Section 1.5.	Added safety information and warnings
1.05.00	Section 3.3.	Added note about motor wire current and voltage requirements
1.04.00	Section 2.4.	Added information about payload mounting holes for limited travel stages
1.03.00	Section 3.2.	Basic Specifications table updated, new Motor Specifications table added
1.02.00	Section 1.4.	ALAR-325-SP dimensions updated
1.02.00	Section 1.3.	Model Numbering System updated
1.02.00	Section 2.3.	Socket head cap screw specification changed from 6mm to M6
1.02.00	Section 3.2.	Basic Specifications table updated
1.02.00	Section 3.4.	Added clarification on which models contain hall effect limit switches
1.01.00	Section 1.4.	Dimensions Section added
1.00.00	--	New Manual

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Reader's Comments

ALAR Series Stage Manual**P/N: EDS121, April 18, 2011****Revision 1.06.00**

Please answer the questions below and add any suggestions for improving this document.



Is the manual:	Yes	No
Adequate to the subject		
Well organized		
Clearly presented		
Well illustrated		

How do you use this document in your job? Does it meet your needs? What improvements, if any, would you like to see? Please be specific or cite examples.

	Stage/Product Details		Name	
Model #			Title	
Serial #			Company Name	
Date Shipped			Address	
Customer Order #				
Aerotech Subsidiary Order #			Email	

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